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NOTES ON CALIFORNIA OLIVES: THEIR ADAPTATIONS AND OILS.

In view of the constantly increasing importance olive culture is attaining in California, I commenced last October, under instructions from Prof. Hilgard, a study of the different olive varieties cultivated in this State and of the quantity and quality of oil produced by each.

The time that could be given to this subject being limited by my other duties, what I considered most important was the identification of the varieties; from which afterward were obtained small samples of fruit used for a chemical test as to the quantity of oil each contained, and, so far as feasible, its quality.

My observations were thus necessarily confined to the plantations at Berkeley, Niles and Mission San Jose, more especially to those of the latter, where, maturity being earlier than in the other two localities, we were enabled to obtain samples sooner.

My first visit was made at the beginning of November, 1890, to the plantation of the California Nursery Co. at Niles, where Mr. John Rock, the president of the company, kindly showed me all the varieties cultivated and gave me much information regarding the large collection of foreign varieties, very well cared for but with only a light crop; partly, doubtless, on account of their imperfect acclimation. The maturity was very late; the variety Rubra alone was just beginning to change color. This backwardness was probably due principally to their growing on low ground; for other trees but a short distance away, but on high ground, showed a more advanced degree of ripeness. This shows that, especially in cool climates, the plantation on high ground is better suited to olives because they receive there more air, heat and light, so much needed by these trees.

I remarked also some damage to the crop caused by a very strong wind which had blown for several days. This damage was still greater at Mission San Jose and at Berkeley, where I think that not only the wind but the dryness of the soil had contributed much to the falling-off of a large quantity of olives. In fact the rain, coming soon after, benefited somewhat the fruit which remained shrunken on the tree, improving it in appearance and size.

My attention was then given exclusively to the olive trees of Prof. Hilgard at Mission San Jose, and there I began the identification of the varieties, of which I could determine only twelve, others being too young or without fruit.

According to my observations, these varieties may be arranged as follows:

According to Time of Ripening.	
1	Nevadillo blanco.
	Atro-violacea.
	Pendoulier.
	Pendulina.
2	Redding Picholine.
3	Manzanillo.
4	Mission.
5	Polymorpha.
	Oblonga.
	Regalis.
6	Columbella.
	Uvaria

According to Productiveness.	
1	Mission.
2	Nevadillo blanco.
	Columbella.
	Uvaria.
	Atro-violacea.
	Redding Picholine.
	Oblonga.
	Regalis.
4	Pendoulier.
	Pendulina.
	Manzanillo.
	Polymorpha.

It must be remembered that, with the exception of the Mission olive, most of the trees are young, and therefore the amount of the crop may not correspond exactly with what would be obtained with older trees; so these data must be taken with due allowance.

In the plantation of the University at Berkeley the succession of ripening was the same as at Mission San Jose, but the fruit matured correspondingly from one to four weeks later. The yield ranged from small to very small on all the trees, with the exception of the Nevadillo blanco and the Mission, which had a good crop. Some trees of the former are already about seven years old, and those of the latter are represented by two large and old specimens. All the other trees are from four to five years old.

The results obtained should, however, be taken only as a preliminary experiment, and not as absolute; because the number of samples of the localities represented, and the special conditions of the fruit, were not such as to give completely decisive results. Next season the tests will be arranged in such a manner as to work on numerous good and large samples from various localities in the State.

We are also indebted to Mr. Geo. C. Roeding, who supplied us with six larger samples, produced at the Fancher Creek Nursery at Fresno.

The first samples received from Fresno consisted of five varieties, one of which, (name unknown), had been picked November 4th. The others were the Pendulina, Nevadillo blanco, Manzanillo, Atro-violacea; while the sixth sample, of the Rubra, was picked on February 5, 1891.

Their condition was as follows:

Pendulina—In fair condition; some olives dried and beginning to spoil; maturity far advanced.

Nevadillo blanco—In fair condition, but over-ripe.

Manzanillo—In fair condition; some dried olives; generally over-ripe.

Atro-violacea—In good condition and at the right degree of maturity for warm climates.

No name—In fair condition and over-ripe. This olive resembles somewhat the Italian Cerasola, but it is a little larger.

Rubra—In very bad condition; damaged by frost; maturity, at the right degree for warm climates.

From Mission San Jose was received also a sample of Nevadillo blanco, gathered January 13, 1891. It was in rather good condition, but the maturity was a little passed.

All the above samples, except the Rubra, were made into oil by the usual and practical method, in order to have a small quantity of oil for testing its character.

OBSERVATIONS ON THE OILS OBTAINED.

On March 13, 1891, I made the following observations on the oils obtained:

From Fresno—

Atro-violacea — Condition thickish, not clear; color, yellowish-brown; odor, not pronounced; taste, rather greasy and coarse. It seems to be slow in clearing. General quality, fair.

Nevadillo blanco—Condition, fluid, clear, but not yet bright; color, light-golden; odor, rather pronounced; taste, a little greasy, otherwise agreeable and delicate. It clears rapidly. General quality, fine.

Pendulina — Condition thickish, not clear; color, yellowish-brown; odor, pronounced; taste, somewhat greasy but agreeable. It will take long to clear. General quality, good.

Manzanillo—Condition, very fluid, bright and transparent; color, fine-golden; odor, slightly suggestive of unsoundness; taste, very slightly rancid, otherwise delicate. General quality, a rather good oil, clearing quickly.

This sample was very small, and it was impossible to keep it well.

No name—Condition, clear but not yet bright, rather fluid; color, fine light-golden; odor, pronounced, but not altogether pleasant: taste, slightly greasy and rank; general quality, a common oil, but clearing quickly.

From Mission San Jose—

Nevadillo blanco — (This oil was made two months after those from Fresno). Condition, fluid and almost clear; color, rather deep-golden; odor, of fresh olives; taste, oil too young for a close judgment, but promises to become a very fine sweet oil.

From the above observations it appears that olives from the country about Fresno, like those from warm countries generally, produce a thickish oil, dark-colored, greasy and therefore not easy to keep; moreover when made in larger quantities, this oil will not clear as quickly as did our small samples. The Nevadillo Blanco yields the best oil among the varieties from Fresno, but still inferior in quality to the same from Mission San Jose, which, although made two months later, promises to clear before or almost at the same time as the other one.

In order to remedy the defects that oils made from olives growing in warm climates are apt to have, the fruit ought to be gathered when still yellowish and only just beginning to change their color. Such fruit would always produce an oil which on account of its delicate taste would have the same reputation as that obtained in cooler climates. If the olive-grower cares more for quantity than for quality, the olives should be gathered when black and still firm; but in no case should this degree of maturity be passed, because the oil from such olives would be of inferior quality, and sometimes also the quantity would be diminished.

The following table, shows the analytical results from the different samples received at this laboratory.

Column 1 shows the proportion by weight between pits and flesh in the fresh fruit. Column 2 shows the proportion in which pits and flesh may be made to contribute to the oil product when fully extracted. Column 3 gives the absolute percentage of oil contained in pits and flesh. Column 4 finally gives the results of the

"Iodine test" much relied upon for the purity of commercial oils, as hereinafter explained.

The minimum is shown by the Atro-violacea from Fresno, which was the best-conditioned

PARTIAL ANALYSIS OF SOME SAMPLES OF CALIFORNIA OLIVES AND OILS.

Variety.	Locality.	Date of Picking.	1. Proportion of pits and flesh in fruit.		2. Percentage of oil in whole fruit yielded by		3. Percentage of oil contained in fresh		4. Iodine absorption. Oil from pressing.	Oil extracted by Carbon Bisulphide.
			Pits.	Flesh.	Pits.	Flesh.	Pits.	Flesh.		
Manzanillo.....	Fresno.	Nov. 4, '90	13.0	87.0	.53	19.23	4.1	21.1	80.2	76.5
Manzanillo.....	Berkeley.	Jan. 31, '91.	16.0	84.0	.51	21.38	3.2	25 45	.....	74.3
Pendulina.....	Fresno.	Nov 4, '90.	14 8	85.2	1.04	17.40	7.0	20.5	82.6	77.7
No Name.....	Fresno.	Nov. 4, '90.	17 6	82.4	.83	16.63	5.0	20.2	80.2	73.4
Atro-violacea....	Fresno.	Nov. 4, '90.	23.7	76.3	1.19	13.78	5.0	18.1	83 2	80.7
Nevadillo blanco.	Fresno.	Nov. 4, '90.	17.5	82.5	1.16	18.02	6.6	22.0	84.5	86.6
Nevadillo blanco.	Mission San Jose.	Jan. 13, '91.	24.0	76.0	1.16	23.94	4.4	31.5	86.5	72.5
Nevadillo blanco.	Berkeley.	Jan 7, '91.	25.0	75.0	1.05	22.72	4 2	30.3	.....	83.2
No. 10 in Row....	Berkeley.	Jan. 7, '91.	30.5	69.5	1.34	18.00	4.4	26 0	.....	80.3
No. 2 in Row....	Berkeley.	Jan. 7, '91.	36.5	63.5	.....	.....	.....	.....	.....	.....
Redding Picholine	Mission San Jose.	Jan. 8, '91.	29.0	71.0	1.88	21.87	6.5	30.8	.....	73.5
Mission.....	Mission San Jose.	Jan. 8, '91.	23.5	76.5	.94	19.07	4.0	24.9	.....	81.0
Rubra.....	Fresno.	Feb. 5, '91	19.5	80.5	.80	17.69	4.1	21.97	.....	74.2

PROPORTION OF PIT TO FLESH.

The first column, exhibiting the proportion of pit and flesh contained in the fruit of the different varieties, shows a maximum of 87 per cent of flesh in the Manzanillo from Fresno, and a minimum of 63.5 per cent in No. 2 (seedling) from Berkeley. On the other hand, the percentages of pits were 13 for the former and 36.5 for the latter. Between the Manzanillo from Fresno and that from Berkeley there is a difference of 3 per cent both in pit and flesh; this is doubtless due to the growth of the former in irrigated land.

The same can be said for the differences existing between the Nevadillo from Fresno and that from Berkeley and Mission San Jose. Summarily the varieties represented could be arranged as follows in regard to smallness of pit and largest amount of flesh: 1. Manzanillo. 2. Pendulina. 3. Nevadillo blanco. 4. No name (Cerasola?) 5. Rubra. 6. Mission. 7. Atro-violacea. 8. Redding Picholine. 9. No. 10 (seedling.) 10. No. 2 (seedling.)

These determinations, which will be continued next season on all obtainable varieties, are very important, because they show especially which kinds are most suitable for pickling purposes, for which the finest and largest olives with the smallest pit are required.

QUANTITY OF OIL.

The next determinations were made with the object of ascertaining the quantity of oil contained in the different varieties.

Of all the varieties represented in the above table, only the Atro-violacea from Fresno, and those from Berkeley, showed exactly the right degree of maturity for oil-making; hence the results obtained cannot be taken as representing exactly the respective practical values of the several kinds. However, with the exception of the Redding Picholine from Mission San Jose, the maturity of which was very far advanced, the other varieties give results which may be considered as showing approximately their relative capabilities.

From these determinations, taking into consideration the degree of maturity of the olives, it appears that the Nevadillo blanco from Berkeley and Mission San Jose contains more oil than the same from Fresno, while in the latter locality, the Manzanillo has produced a little more oil than the Nevadillo; but the Manzanillo from Berkeley contains more oil than that from Fresno.

sample received from that locality.

It is extremely probable therefore, that these consistent differences between the Fresno olives and those from the other localities are mainly due to the growth of the former on flat and heavily irrigated ground, tending to produce watery fruit with relatively little oil, particularly where bottom water lies near the surface.

With respect to the *quantity of oil* contained in them, these varieties can, according to these tests, be arranged as follows:

For Fresno. — 1, Manzanillo; 2, Nevadillo blanco; 3, Rubra; 4, Pendulina; 5, no name (Cerasola?); 6, Atro-violacea.

For Mission San Jose.—1, Nevadillo blanco; 2, Mission. The Redding Picholine cannot be taken into consideration on account of its very advanced maturity.

For Berkeley.—1, Nevadillo blanco; 2, Manzanilla; 3, No. 10 Seedling.

If we consider the quantity of oil that the *pit* may yield, we find the largest percentage in the Pendulina and the smallest in the Manzanillo, both from Fresno; and glancing at the oil yield of the pits of the other varieties, we may conclude that it will be a more or less important consideration, according to the purposes that the oil-maker has in view, or according to the special conditions of his locality.

QUALITY OF OIL.

According to European experience the oil-maker who intends to produce oil of the highest quality must avoid, in its extraction, the grinding of the pits. The kernel contains an oil of inferior quality, which becomes rancid quickly and will spoil the fine oil from the pulp. An exception may exist in the case of varieties which, like the Mission, have abortive kernels.

The crushing of the pits may of course be avoided by the use of adjustable crushers, which crush the pulp while allowing the pit to pass intact.

In this manner oil of very high quality is obtained. Practically, the small quantity of oil yielded by the pits may be neglected, because this loss will be largely repaid by the higher price at which superfine oil can be sold. This loss, moreover, concerns only the first pressing, for the pomace can then be passed again through the mill in order to grind the pits and to have a homogeneous paste with the residues from the pulp. This paste at the second pressing will give a common oil, of edible

quality, which would find a market at a lower price.

I would not now advise making a third quality of oil, or extracting the oil from the oil-cake, because, considering the high price of labor in California and the fact that the uses to which this product could be put are well supplied by other oils (especially cottonseed oil), the practice would not be profitable. The extraction of this inferior grade of oil may become practicable when the production of olives becomes large enough to furnish large quantities of oil-cake at a low figure, in which case factories for the special purpose of extracting this inferior quality might be profitably established.

In considering the results of our experiments, the conclusion is that so far, among the varieties mentioned the Manzanillo seems to be the best for pickling and the Nevadillo best for oil. The latter variety, which, compared with the others, has been recognized as a very good bearer and able to flourish in climate not very favorable to it, ought to be propagated more than has been done so far.

TESTS OF PURITY—IODINE ABSORPTION.

The last column in the table shows some determinations on the "iodine absorption" by the oils obtained from pressing or by chemical way, in order to know if this method could be properly applied to discover adulterations in California olive oil.

According to different authors, the ratio of iodine absorption by olive oil may vary from 79.7 to 88, while most chemists do not admit more than 84.5 as a standard and consider as adulterated every oil which passes this limit.

The maximum of iodine absorption by our pressed oils was 86.5, and in those obtained by extraction by carbon bisulphide was 86.6. All the other oils obtained by chemical extraction showed the iodine absorption smaller than that of the same oils when obtained by pressing.

We cannot, therefore, rely implicitly upon this method for discovering slight adulterations in California oils, and must extend the limit usually admitted for this factor (84.5) at least up to 86.6 for pure oils.

Taking 88.0 as the extreme upper limit, it should be mentioned that among a number of samples of oil sent us by producers and others, the extreme minimum of iodine absorption was found to be 81.1, while among the highest figures were 89.2 and 92.9. Accordingly these two samples might be considered as adulterated; but as yet we reserve our judgment in the premises.

In view of this uncertainty it will be well to mention here a simple and sure method by which adulteration with cottonseed oil (most used for adulteration) can quickly be discovered. It was devised by Prof. E. Bechi, director of the Agricultural Station at Florence, Italy. It has been officially adopted in the chemical laboratories of the Italian Customhouses. This method serves to reveal the presence of cottonseed oil in all seed oils, and even in cod-liver oil. It may be briefly thus described:

An alcoholic solution of nitrate of silver is made in the following way:

Nitrate of silver	1 gram
Alcohol at 98%	200 cubic centimeters
Ethylic ("sulphuric") ether	40 cubic centimeters
Nitric acid	0.1 gram

Another solution also is made of:

Amylic alcohol (fusel oil)	100 cubic centimeters
Pure colza (rapeseed) oil	15 cubic centimeters

The reaction is made in the following way: To 10 cubic centimeters of the oil to be tested add one cubic centimeter of the silver reagent and 10 cubic centimeters of the solution of colza oil in amylic alcohol; stir briskly and divide the mixture so obtained into two equal parts; warm one-half for a quarter of an hour at the boiling point of water, and compare with the other half to see if there has been any change of color. In case of any addition of cottonseed oil a dark brownish-red coloration will be obtained.

According to the author the same result may be obtained without using colza oil, but he employs it in order to obtain always a uniform coloration. As can be seen, this method is very simple and within everyone's reach. By its means we can be sure of the purity of the product we are buying.

GRAPE CUTTINGS FROM FRANCE.

We are indebted to the kindness of the distinguished French ampelographer, Prof. V. Pulliat, for cuttings of 21 varieties of grapes, 11 of which are new to California, or very little known. These are the following:

1. Madeleine angevine. 2. Chasselas Coulard. 3. Agostenga. 4. Pis de chevre rouge. 5. Madeleine royale. 6. Calabrese. 7. Malvoisie jaune du Piemont. 8. Schiradzouli de la Perse. 9. Persan noir de la Savoie. 10. San Antoni. 11. Raisaine.

L. PAPARELLI.

Berkeley, March 28, 1891.